The effect of the PRF and Simvastatin on bone formation and post-surgical inflammation after induction of critical size bone defects in rats tibiae

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Abstract

Aim: This study compares the bone regenerative power of SIM and PRF and the combination added locally on induced bone defect and their effect on inflammatory markers.

Materials and methods: A critical size bone defect was induced in 48 male albino rats of average weight 150–200 g and were divided into 4 groups according to the filling material. Control, PRF, SIM, and SIM/PRF group. Each group was subdivided according to the sacrificing period into two subgroups (one and two-months postoperatively). Tibial specimens were evaluated histologically using Hematoxylin and eosin (H&E) stain, serum inflammatory markers (IL-1β, IL-6, IL-10 and TNF-α) 6 days post-surgery using ELISA technique.

Results: Bone specimens of the SIM group and the combination showed well observed darkly stained areas of matured bone compared to the other groups especially two-month postoperatively, the SIM/PRF group showed matured bone trabeculae surrounding bone marrow spaces which appeared densely stained with normal osteocytes lacunae. Resting and reversal lines were obviously detected in the combination group only, denoting high bone remodeling activity in this group. PRF and SIM decreased significantly the pro-inflammatory IL-1β serum levels compared to the control group, SIM loaded on PRF showed the highest statistical significant decrease in IL-1β serum concentration ($P<0.001$). IL-6 and TNF-α serum levels didn't differ significantly between the control and PRF group, but showed statistical significant decrease in the SIM and SIM//PRF groups. In contrast PRF, SIM and SIM/PRF significantly increased IL-10 serum levels compared to the control group with the highest significant increase in the SIM/PRF group ($P<0.001$).

Conclusion: Comparing SIM with PRF each as a sole filling material in the bone defect, SIM showed more enhanced bone regeneration and more powerful anti-inflammatory effect, while the combination has proven to cause the most significant bone formation but without significant effect on inflammation.